EOS CHEM Validation Working Group Report
April 30, 1999

The validation working group met in Pasadena, California, on April 12. The current formal representatives for the 4 instrument teams are Brian Johnson (bjohnson@ucar.edu) for HIRDLS (absent at this meeting, but HIRDLS material was presented by Bruno Nardi), Gilbert Leppelmeier (gilbert.leppelmeier@fmi.fi) for OMI, David Rider (david.rider@jpl.nasa.gov) for TES, and Lucien Froidevaux [now chairman for this working group] (lucien@mls.jpl.nasa.gov) for MLS. It is expected that more people will join this working group in the future (formally or informally); several others attended this "kick-off" working group meeting (open to anyone interested).

The goals of the meeting were: **(1)** to start formulating and sharing plans/needs for validation from the perspective of each instrument team, and **(2)** to start converging towards a CHEM-wide Validation Plan. Such a plan would be useful since CHEM measurements have a clear focus and there are many geophysical parameters being retrieved by more than one instrument on CHEM. This need is also motivated by the upcoming August meeting in Snowmass, Colorado, where a more general discussion of the possibilities for integrated science and validation "missions" will be pursued.

(1) Instrument team presentations

Each team presented their early views about validation plans and needs. It was useful to remember that validation (as for such previous atmospheric datasets) means a lot of work on a lot of fronts, from instrument calibration (pre- and post- launch) to improvements in spectroscopic knowledge, where possible, error characterization (part of the algorithm issues), "internal" checks/diagnostics of the incoming data after launch, as well as comparisons of retrieved parameters with correlative datasets (both within CHEM and external to CHEM) and atmospheric models.

The primary topics of immediate interest are the needs for external correlative data (since early planning for missions involving aircraft and/or balloons is required) and issues relating to spectroscopic data that could help improve the accuracies of the datasets (useful information before launch...). Some data needs relating to the parameters measured in common by 2 or more of the CHEM instruments are summarized in section (2). More details will be added to this later, as well as for the instrument-specific parameters, which are also clearly part of the validation plan.

Regarding spectroscopy, although much of the spectroscopic data (line positions, strengths, line widths, and temperature dependence) needed for the CHEM

observations is already available, some areas certainly still exist, where additional data would be very useful for improving the accuracy of CHEM data. In particular, water vapor (and dry air) continuum information for a range of the relevant wavelengths would be very desirable. H_2O continuum, H_2O half-widths, and temperature dependence information would be useful in general because H_2O (and temperature) can affect the accuracy of many other parameters. A more detailed listing of the desirable areas for improvements in spectroscopic data will be one of the goals of the validation document being planned.

(2) EOS CHEM Validation Plan

A Framework for Validation

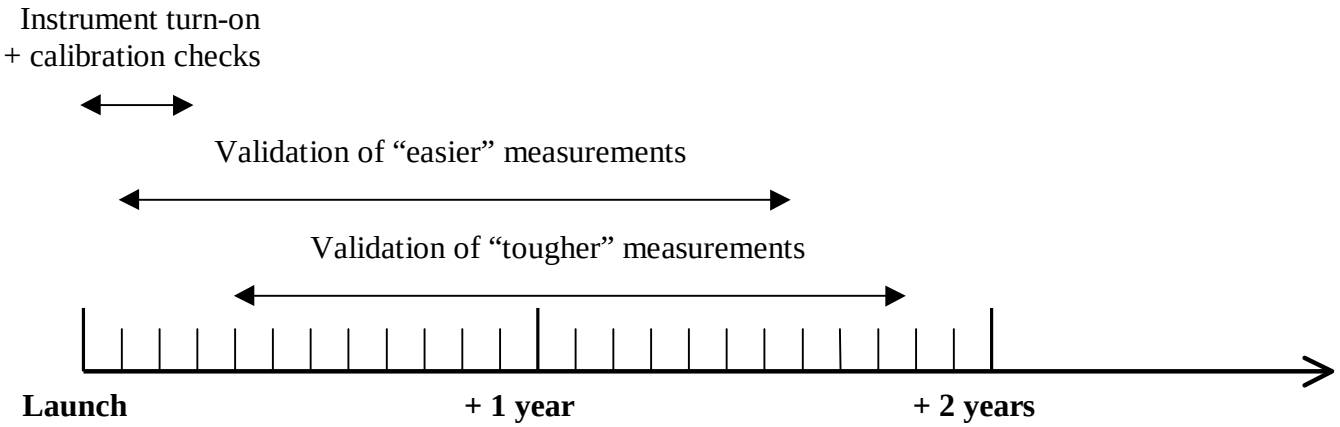
A general framework for validation was discussed. The importance of correlative datasets from fixed sites (and well calibrated instruments) as a function of time should not be underestimated (this was very useful for stratospheric ozone profile validation of SAGE and UARS data). Since this is not possible for all species to the extent that it is for ozone, other sources of correlative data need to be obtained. Also, different latitudes and seasons offer a range of conditions useful for thorough testing of the CHEM retrievals, as well as for interesting scientific studies. Useful conditions include the dry season in the tropics (for a stronger variation in some tropospheric gases in particular, as well as for upper tropospheric humidity data) and the polar vortex during winter/spring (for stratospheric ozone chemistry). Refinement of these "target" conditions is a goal for the EOS CHEM validation plan. A schematic of the framework for validation is included below, noting some of the activities planned after the CHEM launch.

Correlative Data Needs

A preliminary table (see Table 1) was discussed, for those measurements that are common to two or more of the CHEM instruments. This Table will need to be updated with inputs from each team (therefore, it may change in a variety of ways). Further discussion of each team's needs and priorities is planned in the coming months.

A Framework for Validation of EOS CHEM Data

- **Schematic of timeline for validation**



- **Correlative data needs are driven by a desire for comparisons under differing atmospheric conditions and for sufficient statistics**

- **Some desirable attributes of correlative data**

  - **Temporal coverage:** comparisons from fixed sites (*e.g.* for seasonal and longer-term studies)

  - **Spatial coverage:** various latitudes/regions offer different atmospheric conditions for comparison

    Useful conditions: (a) tropics (dry season)
    (b) polar vortex (winter/spring)

    Having both of the above provides a check on both high tropopause and low tropopause conditions (for lower stratospheric and tropospheric data).

  - **Scientific value:** other scientific goals of the (correlative) dataset or mission worth considering

  - **Further points:**
    - **Profiles** are needed (often from the ground to the upper stratosphere) + column data (for OMI)
    - Some averaging (spatial/temporal) of CHEM profiles will sometimes be required for comparison
    - Tropospheric variability is an issue for coincidence criteria between datasets
    - Ideally, would like to have 2 (or more) correlative datasets or techniques for comparison
    - Models are useful for comparison and "first-order" validation (especially for data-poor cases)

- **A variety of data sources will be considered**

A. Fixed sites (*e.g.* balloons, sondes, NDSC, Dobson network, DOE network)
B. Campaigns (aircraft/balloon missions; profiles along CHEM measurement tracks are desirable)
C. Global datasets (*e.g.* Oper. Met. Data, SAGE III, ENVISAT, AIRS, GPS, GOME 2)

Parameter	HIRDLS	MLS	TES	OMI	Comments (correlative data needs)
T	•	•	•		Operational Meteorological Data are good correlative data source; also keep track of upcoming datasets, *e.g.* AIRS, GPS).
Geop. Height	•	•			
O_3	•	•	•	• **C**	Extend/add to tropical (sonde) data.
H_2O	•	•	•		Along-track profiles very desirable (aircraft) + more balloon-borne data. Tropical data very desirable.
CH_4	•		•		Extend/add to correlative data (especially aircraft) planned for MOPITT validation (+ other data for the stratosphere).
CO		•	•		Extend/add to correlative data (especially aircraft) planned for MOPITT validation (+ other data for the stratosphere).
N_2O	•	•	•		Lower stratosphere/upper troposphere profiles along-track very desirable (aircraft).
HNO_3	•	•	•		Lower stratosphere/upper troposphere profiles along-track very desirable (aircraft).
NO_2	•		•	**C**	Diurnal variation affects criteria for coincidence with correlative data. Not many correlative data sources (SAGE III, balloon IR data useful).
BrO		•		**C**	Not many correlative data sources.
Aerosols	•		•		
Clouds	•	•			

Table 1. EOS CHEM common measurements and correlative data needs.
"**C**" means that a column measurement is obtained (OMI data).
This Table is preliminary and will be updated/enhanced.